Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claim 1 (Original): A method of compensating for phase noise added by a spectrum analyzer to measurements of phase noise of a signal under test (SUT) taken by the spectrum analyzer, the method comprising the step of:

applying a correction to a measured phase noise $\mathcal{L}(f_m)$ value for the SUT to determine an actual phase noise $\mathcal{L}_A(f_m)$ value for the SUT, wherein the correction comprises mathematically removing an added phase noise $\mathcal{L}_{SA}(f_m)$ value contributed by the spectrum analyzer from the measured phase noise $\mathcal{L}(f_m)$ value of the SUT.

Claim 2 (Currently Amended): The method of Claim 1 wherein the mathematical correction and the actual phase noise $\mathcal{L}_A(f_m)$ value is given by

$$\cancel{\mathcal{L}_T(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} \quad 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)}$$

$$\underline{\mathcal{L}_A(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} - 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)}$$

wherein the term f_m is an offset frequency.

Claim 3 (Original): The method of Claim 1 further comprising the step of measuring phase noise $\mathcal{L}(f_m)$ values of the SUT at a plurality of offset frequencies f_m prior to performing the step of applying the correction.

Claim 4 (Original): The method of Claim 3 wherein the step of measuring comprises averaging a plurality of measurements of the phase noise $\mathcal{L}(f_m)$ values corresponding to each offset frequency f_m.

Claim 5 (Original): The method of Claim 1 further comprising the step of displaying the corrected actual phase noise $\mathcal{L}_A(f_m)$ data.

Claim 6 (Original): The method of Claim 1 further comprising the step of determining the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer at a plurality of offset frequencies f_m.

Claim 7 (Original): The method of Claim 6, wherein the step of determining comprises the step of extracting the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer from data supplied by a manufacturer of the spectrum analyzer.

Claim 8 (Original): The method of Claim 6, wherein the step of determining comprises the step of extracting the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer from added phase noise $\mathcal{L}'_{SA}(f_m)$ specification data for a class of spectrum analyzers to which the spectrum analyzer belongs.

Claim 9 (Original): The method of Claim 6, wherein the step of determining comprises the steps of:

generating a reference signal having a phase noise $\mathcal{L}_{ref}(f_m)$;

measuring a phase noise $\mathcal{L}_{ref}(f_m)$ value of the reference signal at each of the offset frequencies f_m with the spectrum analyzer; and

computing the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer from the measured reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value at each of the offset frequencies f_m.

Claim 10 (Original): The method of Claim 9, wherein the measured reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value is the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer.

Claim 11 (Original): The method of Claim 9, wherein the step of computing comprises subtracting a known reference signal phase noise $\mathcal{L}'_{ref}(f_m)$ value from the measured reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value according to

$$\mathcal{L}_{SA}(f_m) = 10\log\left(10^{\frac{\mathcal{L}_{ref}(f_m)}{10}} - 10^{\frac{\mathcal{L}'_{ref}(f_m)}{10}}\right)$$

to yield the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer at an offset frequency f_m.

Claim 12 (Cancelled).

Claim 13 (Original): The method of Claim 2 further comprising the steps of:

measuring the phase noise $\mathcal{L}(f_m)$ value of the SUT at a plurality of offset frequencies f_m; and

determining the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer at each of the offset frequencies f_m,

wherein the step of measuring and the step of determining are performed prior to performing the step of applying the correction.

Claim 14 (Original): The method of Claim 13, wherein the step of determining comprises the steps of:

generating a reference signal having a phase noise $\mathcal{L}_{ref}(f_m)$;

measuring a phase noise $\mathcal{L}_{ref}(f_m)$ value of the reference signal at each of the offset frequencies f_m with the spectrum analyzer, wherein the measured phase noise $\mathcal{L}_{ref}(f_m)$ value of the reference signal is the determined added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer.

Claim 15 (Cancelled).

Claim 16 (Original): The method of Claim 13, wherein the step of determining comprises the step of extracting the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer from data supplied by a manufacturer of the spectrum analyzer.

Claim 17 (Original): The method of Claim 13, wherein the step of determining comprises the step of extracting the added phase noise $\mathcal{L}_{SA}(f_m)$ value of

the spectrum analyzer from added phase noise $\mathcal{L}'_{SA}(f_m)$ specification data for a class of spectrum analyzers to which the spectrum analyzer belongs.

Claim 18 (Cancelled).

Claim 19 (Currently Amended): ~~The method of Claim 18 wherein in the step of calculating, the actual phase noise $\mathcal{L}_A(f_m)$ is given by~~ A method of determining an actual phase noise of a signal under test (SUT), the method comprising:

measuring phase noise of a spectrum analyzer under reference conditions to obtain an added phase noise value;

measuring phase noise of the SUT using the spectrum analyzer to obtain a measured phase-noise value; and

calculating an actual phase noise according to

$$\mathcal{L}_A(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} - 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)$$

wherein the term $\mathcal{L}_A(f_m)$ is the actual phase noise value at an offset frequency f_m, and the terms $\mathcal{L}(f_m)$ and $\mathcal{L}_{SA}(f_m)$ are the measured phase noise value of the SUT and the added phase noise value of the spectrum analyzer at the offset frequency f_m, respectively.

Claim 20 (Currently Amended): The method of ~~Claim 18~~ Claim 19, wherein ~~the step of~~ measuring phase noise of the spectrum analyzer under reference conditions comprises ~~the steps of~~:

generating a reference signal ~~having a phase noise $\mathcal{L}_{ref}(f_m)$~~;

measuring a phase noise $\mathcal{L}_{ref}(f_m)$ value of the reference signal at each of the offset frequencies f_m with the spectrum analyzer; and

computing the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer from the measured reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value at each of the offset frequencies f_m.

Claim 21 (Cancelled).

Claim 22 (Currently Amended): The method of Claim 20, wherein ~~the step of~~ computing comprises subtracting a known reference signal phase noise $\mathcal{L}'_{ref}(f_m)$ value from the measured reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value according to

$$\mathcal{L}_{SA}(f_m) = 10\log\left(10^{\frac{\mathcal{L}_{ref}(f_m)}{10}} - 10^{\frac{\mathcal{L}'_{ref}(f_m)}{10}}\right)$$

to yield the added phase noise $\mathcal{L}_{SA}(f_m)$ value of the spectrum analyzer at the offset frequency f_m.

Claim 23 (Original): A spectrum analyzer apparatus that corrects for added phase noise contributed by the spectrum analyzer in measurements of phase noise of a signal under test, the apparatus comprising:

a signal conversion and detection portion that measures phase noise $\mathcal{L}(f_m)$ data of the signal under test;

a memory portion that provides data and information storage;

a controller portion that controls the signal conversion and detection portion; and

a compensation algorithm stored in the memory portion and executed by the controller portion, wherein the executed compensation algorithm applies a mathematical correction to the measured phase noise $\mathcal{L}(f_m)$ data of the signal under test, the correction comprising a compensation for the added phase noise $\mathcal{L}_{SA}(f_m)$ in the measured phase noise $\mathcal{L}(f_m)$ to produce actual phase noise $\mathcal{L}_A(f_m)$ data for the signal under test.

Claim 24 (Currently Amended): The apparatus of Claim 23 wherein the mathematical correction and the actual phase noise $\mathcal{L}_A(f_m)$ data is given by

$$\cancel{\mathcal{L}_T(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} - 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)}$$

$$\underline{\mathcal{L}_A(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} - 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)}$$

where f_m is an offset frequency.

Claim 25 (Original): The apparatus of Claim 23, wherein the memory portion comprises the added phase noise $\mathcal{L}_{SA}(f_m)$ data that is used by the compensation algorithm.

Claim 26 (Original): The apparatus of Claim 25, wherein the added phase noise $\mathcal{L}_{SA}(f_m)$ data is measured by the signal conversion and detection portion.

Claim 27 (Currently Amended): A system ~~for compensating~~ <u>that compensates</u> for phase noise added by a spectrum analyzer from phase noise measurements of a signal under test (SUT), the system comprising:

a spectrum analyzer that measures phase noise $\mathcal{L}(f_m)$ data of the signal under test; and

a controller that mathematically corrects the phase noise $\mathcal{L}(f_m)$ data of the SUT measured by the spectrum analyzer to produce ~~actual phase noise $\mathcal{L}_T(f_m)$~~ <u>actual phase noise $\mathcal{L}_A(f_m)$</u> data for the SUT.

Claim 28 (Original): The system of Claim 27, wherein the controller comprises a control algorithm that mathematically removes added phase noise $\mathcal{L}_{SA}(f_m)$ data contributed by the spectrum analyzer from the measured phase noise $\mathcal{L}(f_m)$ data of the signal under test.

Claim 29 (Currently Amended): The system of Claim 28, wherein the controller further comprises:

a memory;

a central processing unit (CPU), wherein the control algorithm is stored in the memory and executed by the CPU; and

an input/output interface that interfaces with the spectrum analyzer,

wherein the executed control algorithm receives the measured phase noise $\mathcal{L}(f_m)$ data for the SUT from the spectrum analyzer using the interface, and wherein the control algorithm implements

$$\cancel{\mathcal{L}_T(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} - 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)}$$

$$\underline{\mathcal{L}_A(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} - 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)}$$

to compensate for the added phase noise $\mathcal{L}_{SA}(f_m)$ data contributed by the spectrum analyzer from the measured phase noise $\mathcal{L}(f_m)$ data of the signal under test to produce the actual phase noise $\mathcal{L}_A(f_m)$ data for the signal under test, where f_m is an offset frequency.

Claim 30 (Original): The system of Claim 29, wherein the executed control algorithm further controls the spectrum analyzer using the interface during a phase noise measurement of the signal under test.

Claim 31 (New): A spectrum analyzer comprising:

a signal conversion and detection portion that measures phase noise $\mathcal{L}(f_m)$ of a signal under test at an offset frequency f_m;

a memory portion that provides data and information storage;

a controller portion that controls the signal conversion and detection portion; and

a compensation program stored in the memory portion and executed by the controller portion, the executed compensation program applying a mathematical correction to the measured phase noise $\mathcal{L}(f_m)$ to produce an actual phase noise $\mathcal{L}_A(f_m)$ for the signal under test, the correction comprising compensation for added phase noise $\mathcal{L}_{SA}(f_m)$ associated with the spectrum analyzer in the measured phase noise $\mathcal{L}(f_m)$, the added phase noise $\mathcal{L}_{SA}(f_m)$ being either determined by measuring a reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value with the spectrum analyzer and removing from the reference signal phase noise $\mathcal{L}_{ref}(f_m)$ an *a priori* known reference signal phase noise $\mathcal{L}'_{ref}(f_m)$

value or determined from spectrum analyzer phase noise data supplied by a manufacturer of the spectrum analyzer.

Claim 32 (New): The method of Claim 31, wherein the mathematical correction and the actual phase noise $\mathcal{L}_A(f_m)$ data are given by

$$\mathcal{L}_A(f_m) = 10\log\left(10^{\frac{\mathcal{L}(f_m)}{10}} - 10^{\frac{\mathcal{L}_{SA}(f_m)}{10}}\right)$$

and wherein removing comprises subtracting the known reference signal phase noise $\mathcal{L}'_{ref}(f_m)$ value from the measured reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value according to

$$\mathcal{L}_{SA}(f_m) = 10\log\left(10^{\frac{\mathcal{L}_{ref}(f_m)}{10}} - 10^{\frac{\mathcal{L}'_{ref}(f_m)}{10}}\right)$$

to yield the added phase noise $\mathcal{L}_{SA}(f_m)$ of the spectrum analyzer.

Claim 33 (New): The spectrum analyzer of Claim 31, wherein the *a priori* known reference signal phase noise $\mathcal{L}'_{ref}(f_m)$ is either derived from data provided by a manufacturer of the reference source or measured independently of measuring the reference signal phase noise $\mathcal{L}_{ref}(f_m)$ value using the spectrum analyzer.

Claim 34 (New): The spectrum analyzer of Claim 31, wherein the added phase noise $\mathcal{L}_{SA}(f_m)$ is determined from added phase noise $\mathcal{L}'_{SA}(f_m)$ specification data for a class of spectrum analyzers to which the spectrum analyzer belongs.